Simple errors but great loss – Can these be avoided

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Abstract

Introduction: Quality in laboratory medicine refers to satisfaction of the needs and expectations of users or customers which can be achieved by providing a guarantee in each and every step like the whole testing process which in turn includes the physician ordering the test, pre – analytical, analytical, post – analytical phases and finally the results for interpretation. The aim of this study is to highlight human dependent errors that affects biochemical tests, through cases which we encountered in our lab.

Conclusion: To prevent these errors, a symbiotic and synergistic participation should be there amongst the lab personnel and the health care team. This goal can be achieved with proper education and training of individuals involved in this process. Thus, prevention of these errors will help in better and effective patient management.

Keywords: Errors, Hyperkalemia, Hypernatremia, Lipemic, Preanalytical.

Introduction

Quality in laboratory medicine refers to satisfaction of the needs and expectations of users or customers[1] which can be achieved by providing a guarantee in each and every step like the whole testing process which in turn includes the physician ordering the test, pre–analytical, analytical, post – analytical phases and finally the results for interpretation. Preanalytical errors (PAEs) are errors which occur prior to the analysis of the specimen stage in total testing process which can occur either before the receiving the specimen or after receiving it. It is a known fact that they contribute upto 68.2% proportion of errors in laboratory.[2-4] Depending upon the time at where and when the error occurred we, as clinical biochemists, classified these errors as preanalytical, analytical, and postanalytical errors of which preanalytical phase is a critical integral part of laboratory medicine.[5] The components of pre – analytical phase are pre–collecton variables and specimen collection proper. Pre-collection variables are physiologic factors like diurnal variation, exercise, diet, posture, age, stress gender and common in-vivo (tobacco smoking) and in – vitro (hemolysis) factors. Some of the pre–analytical errors include Misidentification of the specimen, mislabelling of the specimen, wrong anticoagulant, wrong anti–coagulant/blood ratio, mixing problems or clots, hemolysis/ lipemia, hemoconcentration due to prolonged tourniquet time, exposure to light / temperatures, delayed delivery to laboratory and processing errors.[6] The percentage of error escalates notably in those handled in the human reliable sections. All these can lead to delay in diagnosis, inappropriate therapeutic intervention, additional prognostic investigations which can affect the patient safety and also the effectiveness on laboratory services.[7,9] Majority of these preanalytical errors handled in human reliable sections[10] are preventable[11,12] as in comparison to the analytical and postanalytical phases, since the preanalytical phase involves much more human handling.

The aim of this study is to highlight human dependent errors that affects biochemical tests; through cases which we encountered in our lab.

Case Report 1

A sample was sent for renal function tests to the Biochemistry laboratory. On separation it was grossly lipemic (Fig. 1). Analysis of the sample couldn't be done. Fasting sample was requested to be sent the next day. On separation the serum was clear (Fig. 2). When enquired the patient was admitted in surgical ward a case of corrosive acid ingestion on total parenteral nutrition. The patient was receiving Celemin and Celepid infusions intravenously once daily. The sample was collected by the house surgeon after administering Celepid (fat emulsion).

Fig. 1: Lipemic serum after administering Celepid

Fig. 2: Clear serum (next day) before administering Celepid

Discussion: Lipemia is accumulation of lipoprotein particles resulting in turbidity of the sample. Lipemic sera are of common occurrence in clinical labs causing interferences in the results of different biochemical analytes. Although pathological conditions like diabetes mellitus, acute pancreatitis, renal failure are responsible for lipemic sera some contribution by preanalytical factors is also observed. Preanalytical factors such as Non-fasting samples and samples taken after administration of parenteral infusion of lipid emulsions are responsible for lipemic sera. To prevent lipemia it is advisable to request fasting samples (8-12hr fast). For persons receiving an infusion, blood should not be obtained proximal to the infusion site,[14] collected from the opposite arm with a gap of eight hours before blood is obtained from a subject who has received a fat emulsion.

Case Report 2

Serum sodium in a patient when analysed was 199mEq/L, Serum potassium was 2.8mEq/L. Patient was in post-operative ward and the nurse who drew the sample remembered that the sample was taken from that limb through which normal saline was being infused.

Discussion: In this case improper timing and incorrect site of collection caused pseudohypernatremia. It is mandatory to keep note of few things like when a sample is collected for estimation of serum electrolytes from a patient on intravenous fluids, the waiting period for collection is 1 hour after stopping the administration of IV fluid.[14] In a case when such things is not possible the sample should be collected from the opposite limb.

Case Report 3

Technician of our lab reported Serum potassium of a sample to be 10mEq/L. The doubt which arose was if it's a plasma (EDTA / oxalate) or haemolysed sample. But, it was a clear serum sample. The patient had taken an unknown poison was under observation, admitted in the medical ward with stable vitals. The attender of the patient informed us that the sample was drawn on the previous day and reached the lab after about 15 hours. Delay was due to ignorance of the attender and negligence of ward nurse.

Discussion: Delay in sample processing lead to a pseudohyperkalemia in this case. This is a processing error in which delay in it. Whenever there is a delay, Glucose in the sample available is utilised and without Glucose there is no ATP generated. Since ATP is required for the proper functioning of the sodium potassium pump and is responsible for maintaining cell membranes gradient, collapse of the pump results in loss of potassium out of the cell, causing pseudohyperkalemia. Other preanalytical errors which result in pseudohyperkalemia are hemolysis of the sample, exercise of the patient's arm with the occlusive cuff in place, inappropriate venipuncture site (i.e., above the potassium-infusion site), and inappropriate collection containers (e.g.: ethylenediaminetetraacetic acid [EDTA] or potassium oxalate Vacutainers).[15-17]

Conclusion

Preanalytical phase plays a very crucial role in quality management of a laboratory. Proper intercommunication skill, conversation in between the lab personnel and health care team is critical to prevent these errors. Clinicians should consult the laboratory personnel when lab values don't correlate with the clinical picture.

Pre-analytical errors can be prevented by the thorough sweeping of the following steps:

1. Establishing the standard operative procedure of writing clearly and with clarity.
2. Strengthen the training of health care professionals.
3. The managerial, support and governing operations to be automated.
4. Checking indicators of quality regularly.
5. Encouraging interdepartmental coalition and also enhancing articulation amongst the health care professionals.[18-20]

Patient safety stresses on the reporting, analysis, and prevention of medical errors that often lead to adverse events. These errors not only cause harm to patient health (delayed treatment, wrong patient management etc) but, also cause great monetary loss to health sector. Though, prevention of preanalytical errors is complex and difficult; yet it does not seem unrealistic. This goal can be achieved with proper education and training of individuals involved in this process. Thus, prevention of these errors will help in better and effective patient management.

Conflict of Interest: None.

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